

**Time 1 ½ hours**  
**Mr. A. Goodison 2<sup>nd</sup> year Science Test GCS**  
**Christmas 2019**

Name \_\_\_\_\_

Answer all questions in the spaces provided.



An image of the international space station. Humans have lived in space since November 2000. The station is used to test spacecraft systems and equipment required for missions to the Moon and Mars

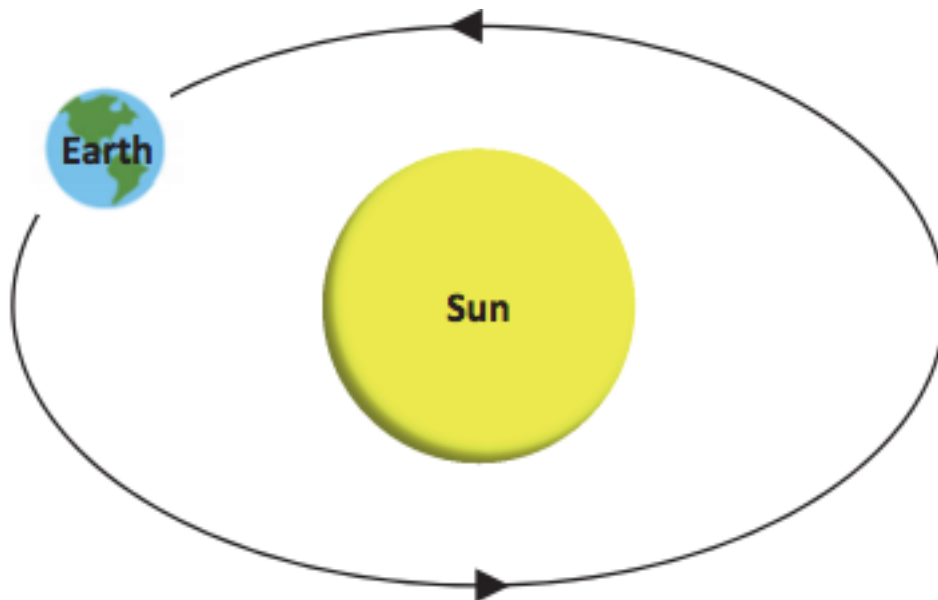
<b>Junior Cycle</b>	
<b>Percentage</b>	<b>Grade Descriptor</b>
≥ 90 to 100	Distinction
≥ 75 and < 90	Higher Merit
≥ 55 and < 75	Merit
≥ 40 and < 55	Achieved
≥ 20 and < 40	Partially Achieved
≥ 0 and < 20	Not Graded (NG)

<b>Question</b>	<b>Marks</b>	<b>Awarded</b>
1	36	
2	30	
3	12	
4	18	
5	21	
6	30	
7	54	
8	18	
<b>Total</b>	<b>219</b>	
<b>Grade descriptor</b>		

### Question 1 (36 marks)

2019 marks the 50th anniversary of humans first landing on the Moon. Since then there have been a number of other missions to the Moon.

(a) The diagram below shows the Earth orbiting the Sun. Complete the diagram to show the **shape, location** and **motion** of the Moon in the Earth-Sun-Moon system. (9)



(b) At the time of the first landing, the Moon was in a waxing crescent phase as seen from Earth.

The images below show different phases of the Moon in sequence, from left to right. Place a tick in the box beneath the image which shows the Moon in a waxing crescent phase. (3)





Shade in the image of the Moon on the left to illustrate the next phase of the Moon in the sequence above. (3)

(c) On January 2<sup>nd</sup> 2019, the Chinese Chang'e-4 lander touched down on the far side or 'dark side' of the Moon.

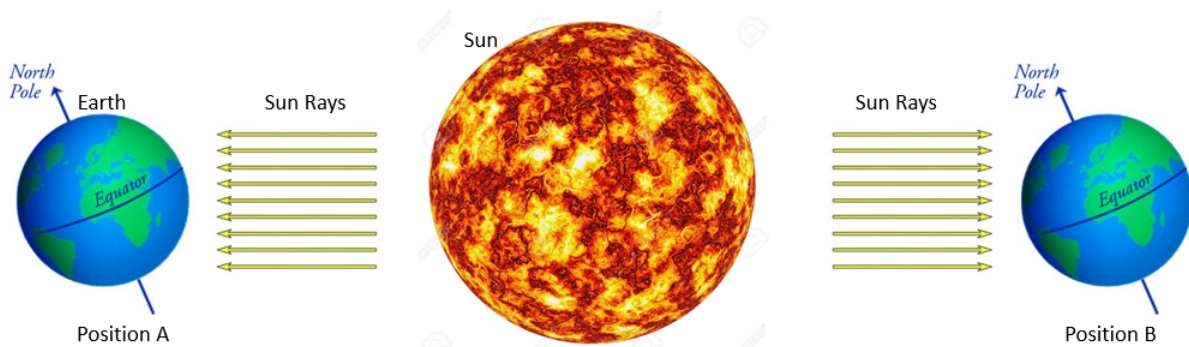
Explain why this side of the Moon is never visible from Earth.

---

(6)

---

Below is an image of the Earth and Sun (not to scale). The Earth is in two different positions (A and B) at different times of the year.



**Image: Sun rays striking Earth at different times of the year**

Ireland is in the Northern Hemisphere and Australia is in the Southern Hemisphere. What season (either **Summer** or **Winter**) are these countries in for the below questions.

Ireland **season** in position A \_\_\_\_\_ (3)

Australia **season** in position A \_\_\_\_\_ (3)

Explain your answer

---



---



---



---

(6)

How many months would it take Earth to travel from position A to position B? \_\_\_\_\_ (3)

## Question 2 (30 marks)

Solar eclipses can happen a few times each year.

(a) The diagram below shows a simple model of a solar eclipse (an eclipse of the Sun). In the diagram, write the letter **E** for Earth, **M** for Moon and **S** for Sun. (9)

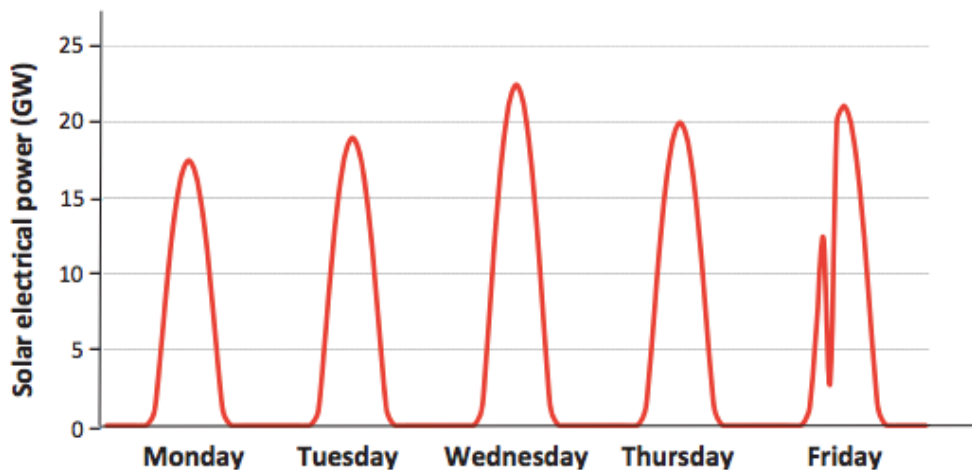


(b) Two weeks before or after a solar eclipse sometimes there is a lunar eclipse (an eclipse of the Moon). Draw a labelled diagram to show a model of a lunar eclipse. (9)

Labelled diagram

A solar eclipse in March 2015 affected the solar electrical power produced in the German electricity grid.

The graph below shows the solar electrical power produced from Monday to Friday during the week of the solar eclipse.



(c) On which day of the week did the solar eclipse occur? Justify your answer.

\_\_\_\_\_  
\_\_\_\_\_(6)

(d) Which was the brightest day of the week? Justify your answer.

\_\_\_\_\_  
\_\_\_\_\_(6)

### Question 3 (12 marks)

The table below shows the melting points and boiling points of four elements. (4 X 3 m)

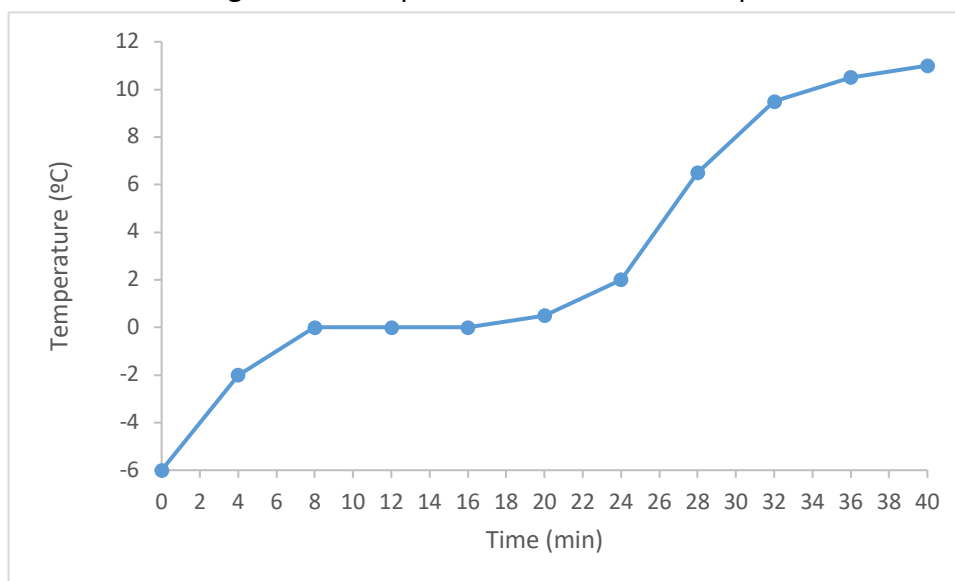
Element	Melting Point (°C)	Boiling Point (°C)
Mercury	-39	357
Copper	1085	2562
Nitrogen	-210	-196
Calcium	842	1484

Answer the following using the table above. Which element in the table is;

- (a) A liquid at 0 °C \_\_\_\_\_
- (b) A solid at 1000 °C \_\_\_\_\_
- (c) A gas at 500° C \_\_\_\_\_
- (d) What state is nitrogen at -200 °C \_\_\_\_\_

### Question 4 (18 marks)

Ice was removed from a freezer, crushed and placed into a test tube and left in a cold room. The graph shows the change in the temperature of the ice over a period of 40 min. (6 X 3 m)



What measuring instrument could be used to measure the temperature? \_\_\_\_\_

How often was the temperature recorded? \_\_\_\_\_

What is happening to the ice between 0 min and 8 min? \_\_\_\_\_

What is happening to the ice between 8 min and 16 min? \_\_\_\_\_

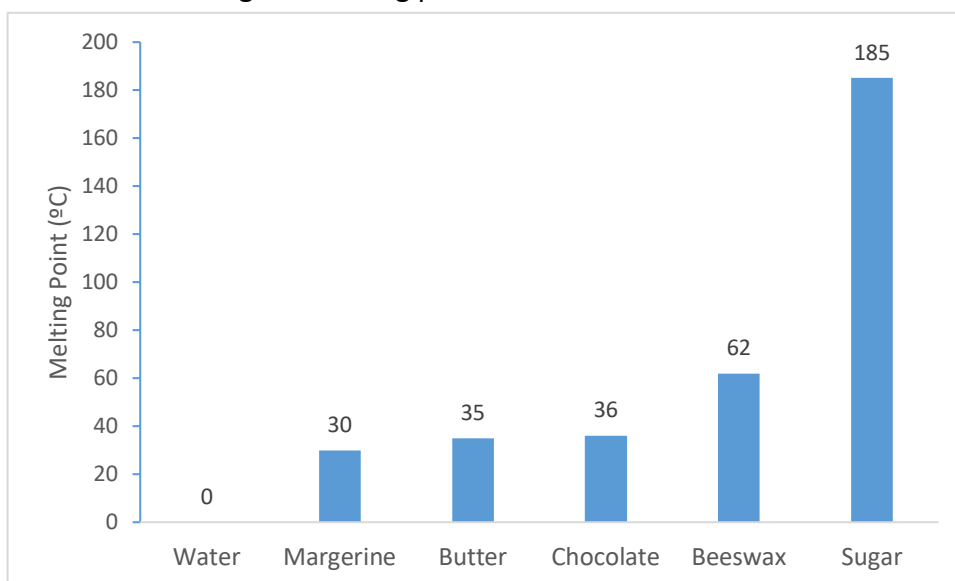
The temperature of the test tube and its contents starts to level off towards the end of the experiment. Why do you think that is?

\_\_\_\_\_  
\_\_\_\_\_(3)

Using the graph, estimate the temperature of the room: \_\_\_\_\_ (3)

### Question 5 (21 marks)

Below is a bar chart showing the melting points of different substances found in the kitchen.



**Graph: melting points for various substances**

Explain what is meant by “melting point”:

\_\_\_\_\_  
\_\_\_\_\_(6)

Human body temperature is 37 °C. **Use the data** from the Graph to say whether butter and/or beeswax would melt in your hand. **Explain your answers:**

(a) Butter (write “melt” or “would not melt”): \_\_\_\_\_ (3)

Explain:

\_\_\_\_\_  
\_\_\_\_\_(3)

(b) Beeswax (write “melt” or “would not melt”): \_\_\_\_\_ (3)

Explain:

\_\_\_\_\_  
\_\_\_\_\_ (3)

A chocolate biscuit cake is made by melting butter and sugar together, and then adding other ingredients.

Using the **Graph** on melting points, what is the **minimum temperature** which the butter and sugar mixture would have to reach to melt both substances?

Answer: \_\_\_\_\_ (3)



### Question 6 (30 marks)

Sodium chloride (table salt) is a white crystalline solid.

Water is a solvent with a boiling point of 100 °C.

Sodium chloride can dissolve in water.



A student was asked to investigate what effect adding salt has on the boiling point of water.

(a) Write a suitable hypothesis for this investigation.

\_\_\_\_\_  
\_\_\_\_\_ (3)

(b) What is meant by the boiling point of a substance?

\_\_\_\_\_  
\_\_\_\_\_ (3)

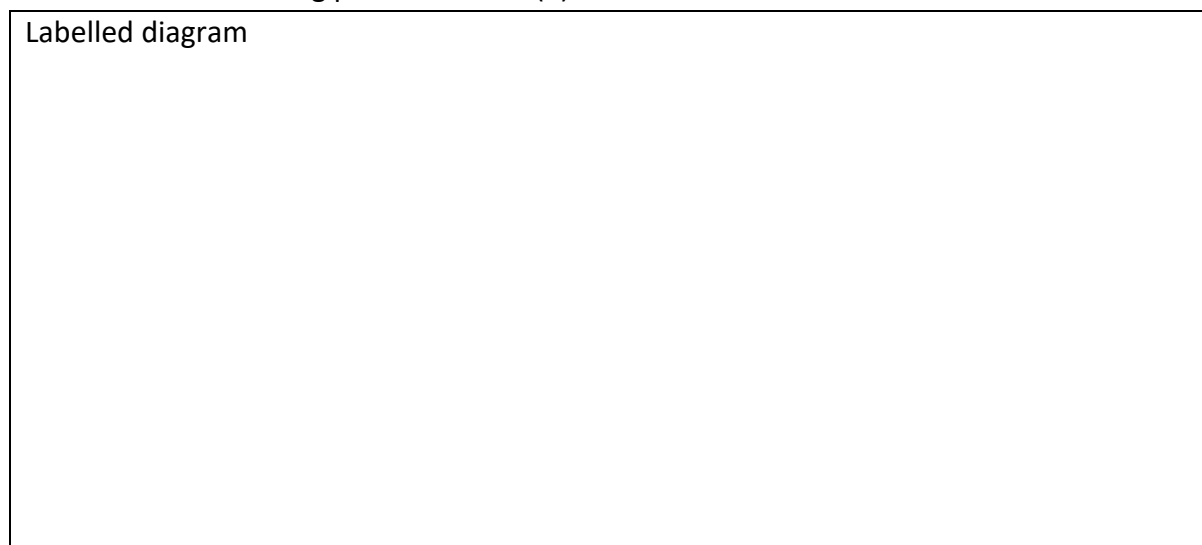
(c) The laboratory instrument used to measure the mass of the salt is shown in the photograph.

Identify this instrument. \_\_\_\_\_ (3)



(d) In the space below, draw a labelled diagram of the arrangement of the apparatus used to determine the boiling point of water. (9)

Labelled diagram

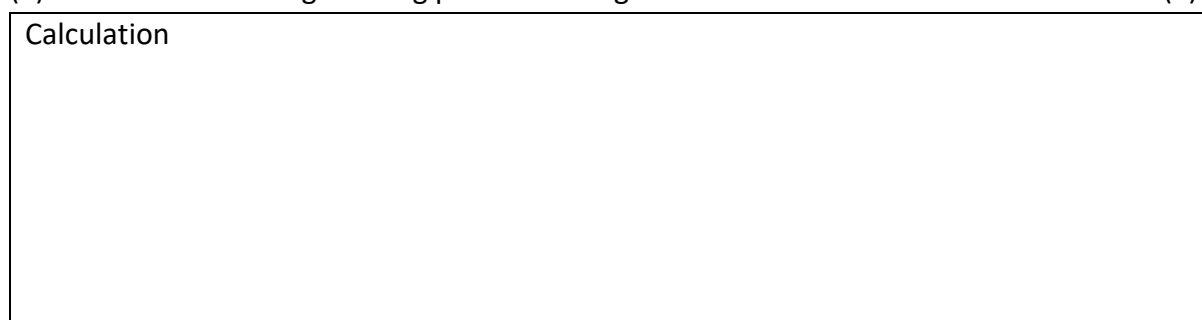


The student collected the following data for the boiling point of the solutions made when various masses of salt were dissolved in 60 cm<sup>3</sup> of water.

Mass of Salt (g)	Boiling Point (°C)					Average boiling point (°C)
0	100	101	100	100	102	100.6
2	101	104	101	100	103	101.8
4	103	105	104	106	107	
6	106	108	107	107	108	107.2
8	108	110	109	111	110	109.6

(e) Calculate the average boiling point when 4 g of salt was dissolved in 60 cm<sup>3</sup> of water. (3)

Calculation



(f) Suggest a reason why the student repeated the investigation five times for each mass of salt used.

---

---

(3)



(g) Does the data support the hypothesis you wrote in part (a)? Explain your answer.

---



---



---



---

(6)

### Question 7 (54 marks)

Aluminium reacts with chlorine to form the compound aluminium chloride. This compound often used in deodorant to help reduce sweating by blocking sweat glands. Use the Periodic Table on page 79 of the Formulae and Tables booklet to predict the ratio of aluminium to chlorine in this compound. Hence write the chemical formula for aluminium chloride (12)

Formula of Aluminum chloride \_\_\_\_\_

### The elements

Periodic table of the elements

1																	18
1 <b>H</b> 1.008															2 <b>He</b> 4.003		
3 <b>Li</b> 6.941	4 <b>Be</b> 9.012											5 <b>B</b> 10.81	6 <b>C</b> 12.01	7 <b>N</b> 14.01	8 <b>O</b> 16.00	9 <b>F</b> 19.00	10 <b>Ne</b> 20.18
11 <b>Na</b> 22.99	12 <b>Mg</b> 24.31											13 <b>Al</b> 26.98	14 <b>Si</b> 28.09	15 <b>P</b> 30.97	16 <b>S</b> 32.07	17 <b>Cl</b> 35.45	18 <b>Ar</b> 39.95
19 <b>K</b> 39.10	20 <b>Ca</b> 40.08	21 <b>Sc</b> 44.96	22 <b>Ti</b> 47.87	23 <b>V</b> 50.94	24 <b>Cr</b> 52.00	25 <b>Mn</b> 54.94	26 <b>Fe</b> 55.85	27 <b>Co</b> 58.93	28 <b>Ni</b> 58.69	29 <b>Cu</b> 63.55	30 <b>Zn</b> 65.41	31 <b>Ga</b> 69.72	32 <b>Ge</b> 72.64	33 <b>As</b> 74.92	34 <b>Se</b> 78.96	35 <b>Br</b> 79.90	36 <b>Kr</b> 83.80
37 <b>Rb</b> 85.47	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.91	40 <b>Zr</b> 91.22	41 <b>Nb</b> 92.91	42 <b>Mo</b> 95.94	43 <b>Tc</b> (97.90)	44 <b>Ru</b> 101.1	45 <b>Rh</b> 102.9	46 <b>Pd</b> 106.4	47 <b>Ag</b> 107.9	48 <b>Cd</b> 112.4	49 <b>In</b> 114.8	50 <b>Sn</b> 118.7	51 <b>Sb</b> 121.8	52 <b>Te</b> 127.6	53 <b>I</b> 126.9	54 <b>Xe</b> 131.3
55 <b>Cs</b> 132.9	56 <b>Ba</b> 137.3	57 <b>La</b> 138.9	72 <b>Hf</b> 178.5	73 <b>Ta</b> 180.9	74 <b>W</b> 183.8	75 <b>Re</b> 186.2	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.1	79 <b>Au</b> 197.0	80 <b>Hg</b> 200.6	81 <b>Tl</b> 204.4	82 <b>Pb</b> 207.2	83 <b>Bi</b> 209.0	84 <b>Po</b> (209.0)	85 <b>At</b> (210.0)	86 <b>Rn</b> (222.0)
87 <b>Fr</b> (223.0)	88 <b>Ra</b> (226.0)	89 <b>Ac</b> (227.0)	104 <b>Rf</b> (261.1)	105 <b>Db</b> (262.1)	106 <b>Sg</b> (266.6)	107 <b>Bh</b> (264.1)	108 <b>Hs</b> (277.0)	109 <b>Mt</b> (268.1)	110 <b>Ds</b> (271.0)	111 <b>Rg</b> (272.2)	112 <b>Uub</b> (285.0)	113 <b>Uut*</b> (289.0)	114 <b>Uuq</b> (289.0)	115 <b>Uup*</b> (289.0)	116 <b>Uuh</b> (289.0)	117 <b>Uus*</b> (293.0)	118 <b>Uuo</b> (293.0)

Match each of the following sub-atomic particles to their descriptions in the table below (9)

Electron	Neutron	Proton
<b>Description</b>	<b>Particle</b>	
Positively charged		
Negatively charged		
No charge		

Which two sub-atomic particles make up the nucleus of an atom? (6)

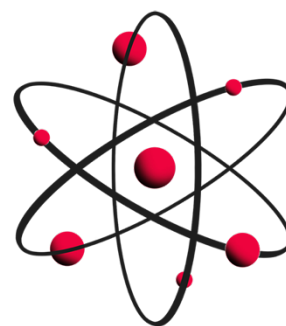
1. \_\_\_\_\_ 2. \_\_\_\_\_

Which two sub-atomic particles have the same mass? (6)

1. \_\_\_\_\_ 2. \_\_\_\_\_

Which sub-atomic particle has the lowest mass? (3)

Answer \_\_\_\_\_



**Identify** the nucleus of the atom on the right by circling it. (3)

The second image on the right shows the Bohr model of an atom.

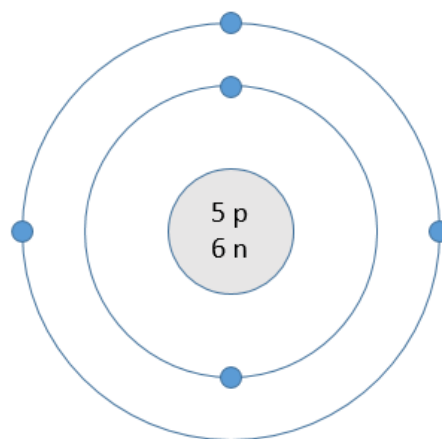
State the atomic number of the atom

\_\_\_\_\_ (3)

State the mass number of the atom

\_\_\_\_\_ (3)

What do the dots on the circles outside the nucleus represent? \_\_\_\_\_ (3)



Using the periodic table, identify the element that is made up of this type of atom. Justify your answer

\_\_\_\_\_  
 \_\_\_\_\_ (6)

### Question 8 (18 marks)

Sophie is a Runner and wants to buy the shoe which will give her the most grip. She sets up an experiment where she is using a newton balance to test the amount of force it takes for the shoe to begin moving.



She gets the following results

Shoe	Nike	Adidas	Asics
Force (N)	3.02	3.42	3.68

Which shoe should she buy so that she has the most grip? \_\_\_\_\_ (3)

In this experiment what was the:

**Cause** variable (the thing she changed). \_\_\_\_\_ (3)

**Effect** variable (the thing she measured). \_\_\_\_\_ (3)

**Control** variable (the things she kept the same). \_\_\_\_\_ (3)

What is the force which causes grip? \_\_\_\_\_ (3)

What is the unit of force? \_\_\_\_\_ (3)

Well done, and thank you for being a great student and making it a pleasure to be your teacher!

Enjoy Christmas =]

If you have time, try to estimate your grade from this test.

**If you are completely finished colour in the below picture**

